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Commercial Energy Code
Building Envelope, Mechanical and Lighting

Montgomery County IECC Policy

Montgomery County has adopted and is currently enforcing the 2009 Edition of International Energy Conservation Code (IECC). IECC is a performance-based national code, which regulates the design of new commercial and multi-family residential buildings for thermal resistance, air leakage, and mechanical, electrical, water-heating, and lighting systems efficiency.

There are three methods of achieving compliance with the IECC:

- Commercial building projects shall meet the requirements in Sections 502 (Building Envelope Requirements), 503 (Building Mechanical Systems), 504 (Service Water Heating) and 505 (Electrical Power and Lighting Systems). (*Prescriptive path*)

- Alternately, the commercial building project shall comply with the requirements of ASHRAE/IESNA 90.1-2007 in its entirety.

- Exception: Buildings conforming to Section 506 provided Sections 502.4, 503.2, 504, 505.2, 505.3, 505.6 and 505.7 are each satisfied. (*Performance path*)

Building Envelope Requirements:

In order to establish compliance with the building envelope requirements of the 2009 IECC, proposed insulation types and levels must be specified in the construction drawings at the time of plan review submittal. For the purpose of plan review, provided on separate sheets, the building shall be divided into the following components; these components shall be depicted within the building thermal envelope:

A. Ceiling Components

Ceilings:

- Flat ceiling
- Cathedral or vaulted ceiling
- Dormer roofs
- Bay window roofs
- Overhead portions of an interior stairway to an attic
- Attic hatches (more than 30 degrees from vertical, otherwise classified as walls)
- A-frames (8 feet above finished floor of top story)

Fenestration:

- Skylights and roof window assemblies

Floors over outside air:

- Floors of overhangs (such as the floor above an entryway or garage)
- Floor cantilevers
- Floors of an elevated structure

B. Wall Components

Walls:

- Opaque portions of above grade walls
- Basement walls and kneewalls less than 50% below grade
- Peripheral edges of floors
- Gable end walls enclosing conditioned space
- Dormer walls
- Roof or attic kneewalls
- Through wall chimneys
- Walls of an interior stairway to an unconditioned basement or space
- Walls enclosing a mansard roof
- Curtain walls
- Skylight shafts

Fenestration:

- Windows, including basement windows (glass and non-glass glazing materials)
- Sliding glass doors
- Opaque doors, glazed doors and combination opaque/glazed doors
- Storefront glazing and commercial entrance doors
- Loading dock doors

C. Floor and Foundation Components

Floors over outdoor air or unconditioned space:

- Floors over an unconditioned crawl space, basement, garage or similar unconditioned space

Basement walls:

- Opaque portions of individual basement walls 85% or more below grade and basement kneewalls where the basement kneewall is 85% or more below grade. Note: Above grade walls are walls on the exterior of the building and completely above grade or are more than 15% above grade.

Slab edge:

- Perimeter edges of slab-on-grade floors

Crawl space walls:

- Walls of crawl spaces below uninsulated floors

The following format shall be used for all IECC plan review submittals using the *Prescriptive Path* (IECC Section 502).

ENVELOPE DESIGN WORKSHEET FOR COMMERCIAL BUILDINGS, IECC SECTION 502

OPAQUE ELEMENTS, MAXIMUM U-FACTORS

(*U*-Factor Alternative) From Table 502.1.2

ROOFS	GROUP R	ALL OTHERS	PROPOSED
Insulation entirely above deck	U-0.048	U-0.048	
Metal buildings	U-0.055	U-0.055	
Attic and other	U-0.027	U-0.027	

WALLS ABOVE GRADE			
Mass	U-0.090	U-0.104	
Metal building	U-0.084	U-0.084	
Metal framed	U-0.064	U-0.064	
Wood framed and other	U-0.064	U-0.089	

BELOW GRADE WALLS			
Below grade wall[a]	C-0.119	C-1.140	

FLOORS			
Mass	U-0.074	U-0.087	
Joist/framing	U-0.033	U-0.033	

SLAB-ON-GRADE FLOORS			
Unheated slabs	F-0.540	F-0.730	
Heated slabs	F-0.860		

a. When slabs are placed below-grade, below-grade walls must meet the *F*-factor requirements for perimeter insulation according to the heated slab-on-grade construction.

OPAQUE ASSEMBLIES MINIMUM R-VALUES

THERMAL RESISTANCE (R-VALUE) From Table 502.2(1)

ROOFS	GROUP R	ALL OTHERS	PROPOSED
Insulation entirely above deck	R-20ci	R-20ci	
Metal buildings with R-5 thermal blocks[a,b]	R-19	R-13+R-13	
Attic and other	R-38	R-38	

WALLS, ABOVE GRADE			
Mass	R-11.4ci	R-9.5ci[c]	
Metal building[b]	R-19	R-19	
Metal framed	R-13+R-7.5ci	R-13+R-7.5	
Wood framed and other	R-13+R-3.8ci	R-13	

WALLS, BELOW GRADE			
Below grade wall[d]	R-7.5ci	NR	

FLOORS			
Mass	R-10.4ci	R-10ci	
Joist/framing, steel/wood	R-30	R-30	

SLAB-ON-GRADE FLOORS	GROUP R	ALL OTHERS	PROPOSED
Unheated slabs	R-10 for 24" below	NR	
Heated slabs	R-15 for 24" below	R-15 for 24" below	
OPAGUE DOORS			
Swinging	U-0.70	U-0.70	
Roll-up or sliding	U-0.50	U-0.50	

For SI: 1 inch = 25.4mm

ci = Continuous insulation. NR = No requirement

a. When using *R*-value compliance method, a thermal spacer block is required, otherwise use the *U*-factor compliance method. [see Tables 502.1.2 and 502.2(2)]

b. Assembly descriptions can be found in Table 502.2(2).

c. R-5.7ci is allowed to be substituted with concrete block walls complying with ASTM C90, ungrouted or partially grouted at 32 inches or less on center vertically or 48 inches or less on center horizontally, with ungrouted cores filled with material having a maximum thermal conductivity of 0.44 Btu-in./h-f^{2}F.

d. When heated slabs are placed below grade, below-grade walls must meet the exterior insulation requirements for perimeter insulation according to the heated slab-on-grade construction.

e. Steel floor joist systems shall be to R-38.

BUILDING ENVELOPE REQUIREMENTS: FENESTRATION (from Table 502.3)

Climate zone 4A (Montgomery County)

Vertical fenestration (40% maximum of above-grade wall)	
***U*-factor**	
Framing materials other than metal with or without metal reinforcement or cladding	
U-factor	0.40
Metal framing with or without thermal break.	
Curtain wall/storefront *U*-factor	0.50
Entrance door *U*-factor	0.85
All other *U*-factor[a]	0.55
SHGC-all frame types	
SHGC: PF < 0.25	0.40
SHGC: 0.25 ≤ PF < 0.5	NR
SHGC: PF ≥ 0.5	NR
Skylights (3% maximum)	
U-factor	0.60
SHGC	0.40

NR = No requirements

PF = Projection factor

a. All others include operable windows, fixed windows and nonentrance doors.

Buildings with a vertical fenestration area or skylight area that exceeds that allowed in this table shall comply with the building envelope provisions of ASHRAE/IESNA 90.1 [See Table 502.2(2)]

TABLE 502.2(2)
BUILDING ENVELOPE REQUIREMENTS-OPAGUE ASSEMBLIES

ROOFS	DESCRIPTION	REFERENCE
R-19	*Standing seam roof with single fiberglass insulation layer*. This construction is R-19 faced fiberglass insulation batts draped perpendicular over the purlins. A minimum R-3.5 thermal spacer block is placed above the purlin/batt, and the roof deck is secured to the purlins.	ASHRAE/IESNA 90.1 Table A2.3 including Addendum "G"
R-13 + R-13 R-13 + R-19	*Standing seam roof with two fiberglass insulation layers.* The first R-value is for faced fiberglass insulation batts draped over purlins. The second R-value is for unfaced fiberglass insulation batts installed parallel to the purlins. A minimum R-3.5 thermal spacer block is place above the purlin/batt, and the roof deck is secured to the purlins.	ASHRAE/IESNA 90.1 Table A2.3 including Addendum "G"
R-11 + R-19 FC	*Filled cavity fiberglass insulation.* A continuous vapor barrier is installed below the purlins and uninterrupted by framing members. Both layers of uncompressed, unfaced fiberglass insulation rest on top of the vapor barrier and are installed parallel, between the purlins. A minimum R-3.5 thermals spacer block is place above the purlin/batt and the roof deck is secured to the purlins.	ASHRAE/IESNA 90.1 Table A2.3 including Addendum "G"
WALLS		
R-16, R-19	*Single fiberglass insulation layer.* The construction is faced fiberglass insulation batts installed vertically and compressed between the metal wall panels and the steel framing.	ASHRAE/IESNA 90.1 Table A3.2 including Addendum "G"
R-13 + R-5.6ci R-19 + R-5.6ci	The first R-value is for faced fiberglass insulation batts installed perpendicular and compressed between the metal wall panels and the steel framing. The second R-value is for continuous rigid insulation installed between the metal wall panel and the steel framing, or on the interior of the steel framing.	ASHRAE/IESNA 90.1 Table A3.2 including Addendum "G"

Building Envelope Compliance Worksheet for the IECC® 2009

Please Complete all Information - Print Clearly - Required on all project plans

Section 1 - Project Information

Project Name		**Permit #**
Address		**Date**
Owner/Agent	Telephone	**Checked By**
Documentation Author	Telephone	**Date** For Department Use

Section 2 - General Information

Building Floor Area:

Window-Wall ratio (WWR): Gross Fenestration Area_____Gross Above Grade Wall Area_____X100_____

Project Description □ New Contruction □Addition □Alteration □Unconditioned Shell

Section 3 - Requirements Checklist

Air leakage and Component Certification Requirements	YES	NO	Notes
All joints/penetrations are caulked, gasketed, weatherstripped or otherwise sealed.			
Windows, doors and skylights certified as meeting leakage requirements.			
Compound R-values and U-factors are labeled as listed			

	Description	Proposed R-Value	Minimum R-Value
Wall Type 1			
Wall Type 2			
Wall Type 3			
Wall Type 4			
Roof Type 1			
Roof Type 2			
Roof Type 3			
Floor Type 1			
Floor Type 2			

		Proposed U-Value	Maximum U-Value
Window 1			
Window 2			
Window 3			
Skylight 1			
Skylight 2			

Skylights less than 3% of the Total Roof Area___% of Roof			
Outdoor air intake and exhaust openings, motorized or gravity			
Loading Dock Weathersealing			
Vestibules Exceptions: 1-6			
Recessed luminaires installed in thermal envelope, sealed/gasketed			

Section 4 - Compliance Statement

The proposed building design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed building design meets the 2009 IECC requirements.

Principal Architect/Designer - Name ☼	Signature	Date

☼***Include the designer's license or registration #***

Mechanical Systems Compliance Worksheet for the IECC® 2009

Please Complete all Information - Print Clearly - Required on all project plans		
Section 1 - Project Information		
Project Name		**Permit #**
Address		**Date**
Owner/Agent	Telephone	**Checked By**
Documentation Author	Telephone	**Date** For Department Use
Section 2 - General Information		
Building Floor Area		
Project Description □ New Contruction □Addition □Alteration □Unconditioned Shell		

Section 3 - Requirements Checklist			
Building Mechanical Systems	YES	NO	Notes
ASHRAE/IESNA 90.1 STANDARD USED FOR COMPLIANCE			
Simple system - (Unitary/packaged)			
Complex system			
Load calculations per ASHRAE/ACCA Standard 183			
Equipment sized to load			
Efficiencies per Tables 503.2.3(1) - 503.2.3(7)			
Thermostatic controls for each zone			
Heat pump supplementary heat controls			
Automatic/programmable off-hour controls for each zone			
Shutoff damper controls/motorized			
Shutoff damper controls/gravity			
Snow melt system			
Ventilation requirements per IMC Chapter 4			
Demand controlled ventilation			
Energy recovery ventilation system			
Ductwork designed, insulated and sealed per IECC/IMC			
HVAC piping insulated per Table 503.2.8			
Air balancing provisions per IMC Chapter 6			
Air system horsepower rating exceeds 5hp			
Heating outside of building, controls provided			
Economizer, required for cooling system ≥54,000 Btu/h			
Variable air volume fan control for motors ≥10hp			
Controls for hydronic system ≥300,000 Btu/h			
Hydronic (water loop) heat pump systems Utilizing heat rejection equipment			
20° deadband or optimized controller			
Open or closed loop or separate heat exchanger			
Part load control method 1 or 2 for ≥300,000 Btu/h			
Pump isolation for 2 or more chillers/boilers			
Fan speed control for motors ≥7.5hp			
Serving multiple zones (Complex) shall be VAV system 30% max air to each zone			
300cfm when ≤10% of total system supply rate			
Minimum ventilation requirements of IMC Chapter 4 Exceptions: 1-6			

Continued			
Single duct VAV terminal device			
Dual duct and mixing VAV terminal device			
Single fan, dual duct, mixing VAV ≥90,000Btu/h no economizer			
Multizone HVAC temperature auto reset			
Exceptions: 1-3			
Service hot water heat recovery, 1 or 2			
Exceptions: 1-2			
Service hot water per table 504.2			
Service hot water setpoint temperature control			
Service hot water, heat traps required			
Service hot water pipe insulation 1" thick minimum			
Service hot water automatic or manual shutoff control			

Section 4 - Compliance Statement

The proposed mechanical design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical system has been designed to meet the 2009 IECC mech

Principal Mechanical Designer - Name ☼	Signature	Date

☼***Include the designer's license or registration #***

Lighting Compliance Worksheet for the IECC☼ 2009

Please Complete all Information - Print Clearly - Required on all project plans

Section 1 - Project Information

Project Name		**Permit #**
Address		**Date**
Owner/Agent	Telephone	**Checked By**
Documentation Author	Telephone	**Date** For Department Use

Section 2 - General Information

Building Floor Area			
Project Description	□ New Contruction	□Addition	□Alteration
Method of Lighting Compliance	□Entire Building	□Tenant Area or Portion of Building	

Section 3 - Requirements Checklist

Lighting Controls, Switching and Wiring	YES	NO	Notes
ASHRAE/IESNA 90.1 STANDARD USED FOR COMPLIANCE			
Independent controls for each interior space			
Light reduction controls to reduce connected load ≥50% Control all luminaires			
Dual switching/alternate luminaires			
Switching middle or individual luminaires			
Automatic lighting shutoff for buildings over 5000sf Scheduled control			
Automatic holiday scheduling feature			
Occupant sensor			
Remote signal control			
Occupant override Required when auto shutoff is employed			
Daylight zone control Independent controls for each daylight zone			
Sleeping unit controls Master switch at main entry			
Master switch in each room of suite			
Exterior Lighting Controls Photo sensor and time switch			
Astronomical time switch			
Tandem Wiring Fluorescent luminaires/recessed/within 10' of each other			
Fluorescent luminaires/pendant/within 1' of each other			

Building Lighting Power, Interior

Prescriptive path

Building type	Allowed Watts	Actual Watts	Lighting Complies Y/N

Performance path/software printout attached →			
Full Compliance with ASHRAE 90.1/documentation attached →			

Building Lighting Power, Exterior

Zone	Base Site Allowance	Sum - Individual Allowances	Total	Lighting Complies Y/N
Separately Metered Dwelling Units →				

Section 4 - Compliance Statement

The proposed lighting design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed lighting system has been designed to meet the 2009 IECC lighting

Principal Lighting Designer - Name - Lic. #	Signature	Date

☼*The Lighting Application Worksheet may be incorporated into the lighting schedule.*

(In addition to IBC requirements)

Commercial Energy Inspection Checklist

Requirement	Verify	Reference
Slab edge insulation R-value and depth	R-value and depth and installation	[502.2.6 and Table 502.2(1)] Approved plans (On-site)
Basement/Below-grade wall insulation	R-value and installation	(502.2.4) Approved plans (On-site)
Crawl space/Under-floor insulation	R-value and installation	(502.2.5) Approved plans (On-site)
Duct sealing and insulation if appropriate	Joint sealing and R-value	(503.2.7-502.7.1.3) Approved plans (On-site)
	Framing Inspection	
Air leakage building envelope	Visual Inspection	502.4.3
Ductwork sealing and insulation	Verify by pressure test or visual inspection	(503.2.7-502.7.1.3) Third party or visual
Fenestration air-leakage	By label	To standards (502.4.1-502.4.2)
Fenestration and skylight areas	Area of windows and skylights	Approved plans
Fenestration and skylight U-factors	By label	Approved plans and certificate
	Insulation Inspection	
Wall insulation properly installed	By wall construction type/visual inspection	502.2.2-502.2.4 Approved plans and certificate
Ceilings or roof insulation	Visual inspection	Table 502.2(1) Approved plans and certificate
Vapor barrier	Visual inspection	402.2.9 Crawlspace
Duct sealing and insulation	Visual joint sealing and R-value	IECC/IRC and Certificate (On-site)
Access hatches and doors	Visual/R-value and sealing	402.2.3
	Final Inspection	
HVAC system controls	1 thermostat per system, programmable if forced air	403.1.1
Ducts insulation, sealing and tightness	Pressure test when outside thermal envelope	403.2 Third party or visual
Building envelope tightness	Blower door test or 402.4.2 verified	Third party or 402.4.2
Recessed lighting	IC rated and sealed (unless in conditioned space)	402.4.2
Lighting	50%/high efficacy, list from electrician/installer	404 or 405 Prescriptive or design
Fireplaces	Visual, gasketed and outdoor air	402.4.3
Mechanical system piping (insulation)	Visual inspection of insulation	403.3
Circulating hot water (insulation/switching)	Visual inspection of insulation and switching	403.4
Mechanical ventilation (dampers)	Visual inspection	403.5
Equipment efficiency	Visual verification	On-site certificate, approved plans
Snow melt systems (if applicable)	Visual inspection	403.8
Heated pools (covers, heaters and switches)	Visual inspection/verification	403.9
Maintenance information	Make certain maintenance documents on site	303.3